

University of Bahrain  
College of Information Technology  
Department of Computer Science  
Semester 2, 2012-2013  
ITCS216 (Data Structures and Algorithms)

**Final Exam**

**Date:** June 9, 2013

**Time:** 11:30-13:30

STUDENT NAME	.....
STUDENT ID #	.....

**NOTES:**

- WRITE ONLY ONE SOLUTION FOR EACH QUESTION.
- SWITCH OFF YOUR MOBILE PHONES.
- THIS EXAM CONTAINS ? PAGES.

QUESTION #	MARKS		COMMENTS
1	9		
2	9		
3	9		
4	6		
5	7		
TOTAL	40		

## **Question 1 (9 marks)**

Write *a member method* called **insertMiddle** to be added to the class **IntDLList**. The method has one parameter **item** of type int to be added in the middle of the doubly linked list as follows:

- If the list is empty, then create a doubly linked list with one node having item as the info of the node.
- If the list has only one node, then insert a new node at the front of the list having item as its info.
- If the list has more than one node, then insert a new node in the middle of the list having item as its info. The position of the new node should be  $n/2$  where  $n$  represents the number of nodes.

Do not call any member method of the class IntDLList.

## **Question 2 (9 marks)**

Write a non-member **boolean** method **areEqualStacks** to the class **stackAsArray** which accepts two stacks **s1** and **s2** and checks whether they are equal or not. The two stacks are equal if their sizes are equal and all their elements are identical and are placed in the same order.

### **Question 3 (9 marks)**

Write a non-member method **splitQueue** to the class **queueAsLinkedList** that divides a queue q1 into two queues q2 and q3 by copying the positive elements of q1 in q2 and the negative elements of q1 in q3. Ignore the zeros. The three queues should be passed as parameters.

Example:

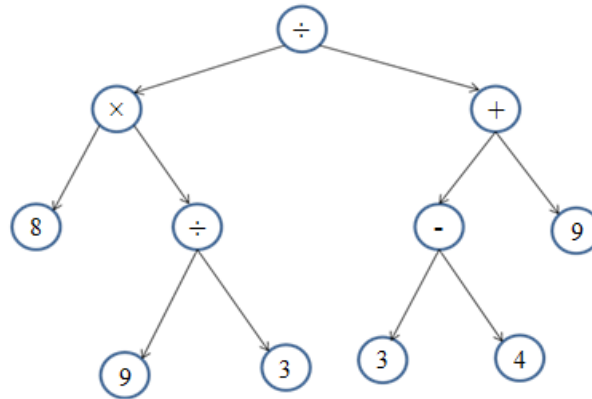
q1: -1 2 0 5 -9 0 -8 4 8

q2: 2 5 4 8

q3: -1 -9 -8

### **Question 4 (3-1-1-1 marks)**

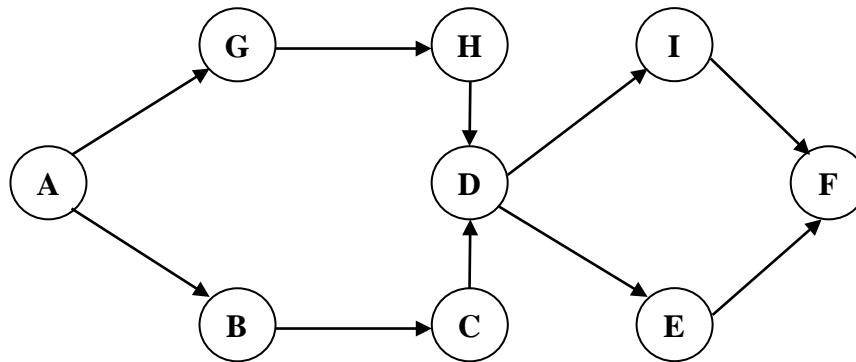
Given the following binary tree T, called also expression tree:



1. Apply an inorder traversal to the tree T to find its value.
2. Find the height of T.
3. Give the level of the node 9 which belongs to  $R_+$ .
4. How many leaves are there in  $L_+$ ?

### **Question 5 (3-2-2 marks)**

Consider the following graph:



1. Find the adjacency list representation of the graph
2. Write the sequence of visited vertices using a depth first traversal of the above graph starting from vertex A.
3. Write the sequence of visited vertices using a breadth first traversal of the above graph starting from vertex A.